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B. Amendment to the Claims

Please amend claim 1 as follows.

1. (Currently Amended) A method for manufacturing a liquid jet recording head which comprises an element substrate provided with a plurality of discharge energy generating elements for applying discharging energy to a recording liquid in accordance with image data, a liquid chamber for storing the recording liquid, and a top plate having a plurality of nozzles and which is formed by jointing the element substrate and the top plate so that each of the discharge energy generating elements faces the respective nozzle, the method comprising:

a step of forming, in ~~on~~ an anisotropic-etching mask layer provided on a nozzle surface of the top plate, compensation patterns extending into a liquid chamber region in order to form the nozzles and the liquid chamber by anisotropic etching; and

a step of performing anisotropic etching of the top plate using ~~through~~ the ~~mask layer~~ compensation patterns as a mask so that (i) the top plate is over-etched; (ii) the compensation patterns extending into the liquid chamber region are removed; and (iii) ~~forming~~ the liquid chamber having ~~to have~~ a substantially rectangular shape at the nozzle surface of the top plate is formed ~~by over-etching portions with the compensation patterns~~.

2. (Original) A method for manufacturing a liquid jet recording head according to claim 1, wherein the top plate comprises a silicon wafer having a <110> oriented surface.

3. (Original) A method for manufacturing a liquid jet recording head according to one of claims 1 and 2, wherein the compensation patterns are comb-shaped

and are arranged to oppose each other so as to define a ladder-shaped opening region between the compensation patterns at the center portion of the liquid chamber region.

4. (Original) A method for manufacturing a liquid jet recording head according to one of claims 1 and 2, wherein the compensation patterns are arranged to oppose each other so as to define a substantially H-shaped opening region between the compensation patterns at the center portion of the liquid chamber region.

5. (Original) A method for manufacturing a liquid jet recording head according to one of claims 1 and 2, wherein each of the compensation patterns is designed by combining at least one line having an angle of 55° relative to a <111> plane in the nozzle direction of the silicon wafer and at least one line having an angle of 71° relative to the same <111> plane, and the compensation patterns are arranged to oppose each other separated by an opening region in the center portion of the liquid chamber region.

6. (Original) A method for manufacturing a liquid jet recording head according to one of claims 1 and 2, wherein each of the compensation patterns is designed by combining at least one line having an angle of 55° relative to a <111> plane in the nozzle direction of the silicon wafer, at least one line having an angle of 71° relative to the same <111> plane, and at least one line parallel to the nozzle arraying direction, and the compensation patterns are arranged to oppose each other separated by an opening region in the center portion of the liquid chamber region.

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B. Remarks

The claims are 1-6, with claim 1 being the sole independent claim. Reconsideration of the present claims is expressly requested.

Claims 1-4 stand rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by U.S. Patent No. 5,992,974 (Miyata). Claims 5 and 6 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Miyata. The grounds of rejection are respectfully traversed.

In the Advisory Action dated May 6, 2003, the Examiner deemed the compensation patterns in Miyata to be represented by reference number 7 in Fig. 5(h). Applicant respectfully disagrees.

In the presently claimed invention, the top plate is anisotropically etched through a mask layer and the liquid chamber is formed to have a substantially rectangular shape at the nozzle surface of the top plate by over-etching portions with the compensation patterns, which extend into the liquid chamber region. As a result, the liquid chamber and the plurality of nozzles are formed on the top plate.

However, in Fig. 5(h) of Miyata, the liquid chamber and the nozzle clearly are not formed on the same plate. Specifically, while the nozzle plate 6 contains a nozzle 7, it does not contain a liquid chamber. The liquid chamber in Miyata is formed in the based material 42 via anisotropic etching, as shown in Fig. 5(a)-(g). Then, the nozzle plate is bonded to this etched base material (col. 7, lines 42-52). Therefore, it is clear that the nozzle 7 cannot be a "compensation pattern" as presently claimed. Accordingly, Miyata cannot affect the patentability of the presently claimed invention.

The Examiner stated in the Advisory Action that the proposed drawing corrections filed on April 23, 2003 are disapproved, because they are not marked in red. The Examiner will note that Applicant did not file proposed drawing corrections on April

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23, 2003. The drawings filed on April 23, 2003 are new formal drawings, which reflect the changes approved by the Examiner in the February 25, 2003 Office Action. Clearly, new formal drawings should not be marked in red.

Wherefore, Applicant respectfully requests that the above rejections and the objection to the drawings be withdrawn and the present application be passed to issue.

This Response After Final Rejection should be entered, because it places the case in allowable form. Alternatively, this Response places the case in better form for possible appeal.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,

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In the presently claimed invention, the top plate is anisotropically etched through a mask layer and the liquid chamber is formed to have a substantially rectangular shape at the nozzle surface of the top plate by over-etching portions with the compensation patterns, which extend into the liquid chamber region. As a result, the liquid chamber and the plurality of nozzles are formed on the top plate.

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B. Amendment to the Claims

Please amend claim 1 as follows. A detailed listing of all the claims in the application is provided.

1. (Currently Amended) A method for manufacturing a liquid jet recording head which comprises an element substrate provided with a plurality of discharge energy generating elements for applying discharging energy to a recording liquid in accordance with image data, a liquid chamber for storing the recording liquid, and a top plate having a plurality of nozzles and which is formed by jointing the element substrate and the top plate so that each of the discharge energy generating elements faces the respective nozzle, the method comprising:

a step of forming, on an anisotropic-etching mask layer provided on a nozzle surface of the top plate, compensation patterns extending into a liquid chamber region in order to form the nozzles and the liquid chamber by anisotropic etching; and

a step of performing anisotropic etching of the top plate through the mask layer and forming the liquid chamber to have a substantially rectangular shape at the nozzle surface of the top plate by over-etching portions with the compensation patterns.

2. (Original) A method for manufacturing a liquid jet recording head according to claim 1, wherein the top plate comprises a silicon wafer having a <110> oriented surface.

3. (Original) A method for manufacturing a liquid jet recording head according to one of claims 1 and 2, wherein the compensation patterns are comb-shaped and are arranged to oppose each other so as to define a ladder-shaped opening region between the compensation patterns at the center portion of the liquid chamber region.

4. (Original) A method for manufacturing a liquid jet recording head according to one of claims 1 and 2, wherein the compensation patterns are arranged to oppose each other so as to define a substantially H-shaped opening region between the compensation patterns at the center portion of the liquid chamber region.

5. (Original) A method for manufacturing a liquid jet recording head according to one of claims 1 and 2, wherein each of the compensation patterns is designed by combining at least one line having an angle of 55° relative to a <111> plane in the nozzle direction of the silicon wafer and at least one line having an angle of 71° relative to the same <111> plane, and the compensation patterns are arranged to oppose each other separated by an opening region in the center portion of the liquid chamber region.

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C. Remarks

The claims are 1-6, with claim 1 being the sole independent claim. Claim 1 has been amended for clarification. No new matter has been added. Reconsideration of the present claims is expressly requested.

Claims 1-4 stand rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by U.S. Patent No. 5,992,974 (Miyata). Claims 5 and 6 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Miyata. The grounds of rejection are respectfully traversed.

The present invention relates to a method for manufacturing a liquid jet recording head. In this method, the top plate is anisotropically etched through a mask layer and the liquid chamber is formed to have a substantially rectangular shape at the nozzle surface of the top plate by over-etching portions with the compensation patterns. These compensation patterns are formed so that they extend into the liquid chamber region (See, e.g., Fig. 2A and page 15, line 16 - page 16, line 10).

Miyata is directed to an ink-jet head having nozzle openings through which ink droplets are discharged. Applicant respectfully submits that Miyata fails to disclose or suggest forming compensation patterns that extend into a liquid chamber region, which patterns are then used to anisotropically etch and over-etch the top plate to form, for example, the liquid chamber. This reference teaches using silicon dioxide layers 41 and 41' (Fig. 5d) to form the nozzle and the ink reservoir by anisotropic etching (Fig. 7(b)).[1] These silicon dioxide layers clearly do not extend into the liquid chamber region. Accordingly, it

1/ The Examiner will note that another silicon dioxide layer 41 below the monocrystalline substrate 40 cannot be deemed a compensation pattern, because it is not used for overetching. Also, this silicon dioxide layer is not formed on an anisotropic-etching mask layer.

is clear that Miyata cannot anticipate the presently claimed invention or render it unpatentable.

Wherefore, Applicant respectfully requests that the above rejections be withdrawn and the present application be passed to issue.

This Amendment After Final Rejection should be entered, because it places the case in allowable form. It is clear that the change made in claim 1 does not raise new issues requiring further consideration and/or search. Alternatively, this Amendment places the case in better form for possible appeal.

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